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Table VI.

The numbers at the top of each compartment denote $\frac{I_0 - I_1}{I_0 + A}$.

The numbers at the bottom of each compartment denote $\frac{I_0 + I_1}{I_0 + I_1 + 2A}$.

θ	r^0	r^{-2}	r^{-4}	r^{-6}
°				
15·0	0·4612	0·714	0·807	0·8
	0·9307	0·969	—	—
22·5	0·4122	0·669	6 755	0·78
	0·8416	0·930	0·955	—
30·0	0·3427	0·6053	0·6924	0·739
	0·7125	0·8699	0·9110	0·941
37·5	0·2523	0·5224	0·6115	0·655
	0·5029	0·7872	0·8534	0·888
45·0	0·1410	0·4204	0·5131	0·559
	0·3120	0·6749	0·7742	0·824
52·5	0·0104	0·3000	0·3970	0·4457
	0·0235	0·5229	0·6624	0·7167
60·0		0·1307	0·2207	0·2644
		0·2485	0·4079	0·4879
67·5			0·1202	0·1619
			0·2666	0·3655
75·0				0·0192
				0·0538

A Comparison between the Right Ascensions and North Polar Distances of the Nautical Almanac and the General Cape Catalogue for 1880. By E. J. Stone, M.A., F.R.S.

The following paper contains a comparison between the results of my Cape Catalogue, now passing through the press, and the Right Ascensions and North Polar Distances of the stars given in the *Nautical Almanac* for 1880.

The places of the principal stars given in the *Nautical Almanac* are chiefly based upon the numerous and long-continued Greenwich observations. These places, if not entirely free from systematic errors, must have their errors confined within small limits. It appeared to me, therefore, desirable that the Cape results should be compared with these *Nautical Almanac* places before the Cape Catalogue was finally committed to the press. The

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results obtained will, I think, be found sufficiently interesting to justify their publication in the proceedings of the Society.

The comparison here made is, however, by no means a favourable one for the exhibition of the accuracy obtained in the Cape work. It was no part of my plan, at the Cape, to obtain a large number of observations of the principal stars. These *Nautical Almanac* stars have therefore not been observed more frequently than the smallest stars contained in the Cape Catalogue; whilst the position of many of the *Nautical Almanac* stars has been unfavourable for accurate observation at the Cape.

All the results, whether discordant or not, have been given. The differences have been inclosed in parentheses, and not used when the *Nautical Almanac* places may, to some extent, depend upon Cape observations, or when the stars are double stars and the centre of the mass has been observed, or when the proper motions are very large and, perhaps, variable, as in the cases of *Sirius* and *Procyon*.

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Comparison between the Results of the Cape Catalogue for 1880 *and those of the Nautical Almanac for the same* Year.

Name of Star.	*N.A.* R.A.			Seconds of Cape R.A.	Cape—*N.A.*	*N.A.* N.P.D.			Seconds of Cape N.P.D.	Cape—*N.A.*	No. of Cape Obs. N.P.D.
	h	m	s	s	s	°	′	″	″	″	
α Andromedæ	0	2	11·17	11·14	−0·03	61	34	19·72	20·58	+0·86	2
γ Pegasi	0	7	3·43	3·41	−0·02	75	29	1·86	0·92	−0·94	7
ι Ceti	0	13	18·71	18·75	+0·04	99	29	22·61	22·15	−0·46	8
β Hydri	0	19	25·36	25·32	(−0·04)	167	55	49·42	48·68	(−0·74)	73
12 Ceti	0	23	54·82	54·82	0·00	94	37	14·19	14·32	+0·13	9
β Ceti	0	37	33·84	33·85	+0·01	108	38	44·46	44·05	−0·41	3
δ Piscium	0	42	27·33	27·32	−0·01	83	4	6·31	6·02	−0·29	3
ε Piscium	0	56	43·01	42·95	−0·06	82	45	23·50	22·89	−0·61	5
β Andromedæ	1	3	0·97	1·07	+0·10	55	0	57·32	56·25	−1·07	2
θ Ceti	1	18	1·45	1·50	+0·05	98	48	10·75	11·21	+0·46	4
η Piscium	1	25	3·75	3·79	+0·04	75	16	23·89	24·06	+0·17	5
α Eridani	1	33	14·54	14·60	(+0·06)	147	50	48·60	49·01	(+0·41)	72
ν Piscium	1	35	11·14	11·18	+0·04	85	7	13·63	13·14	−0·49	4
ο Piscium	1	39	3·43	3·43	0·00	81	26	48·95	49·16	+0·21	3
β Arietis	1	48	0·64	0·71	+0·07	69	46	45·59	45·45	−0·14	3
α Arietis	2	0	24·59	24·56	−0·03	67	6	21·10	20·35	−0·75	5
67 Ceti	2	10	59·83	59·82	−0·01	96	58	33·88	33·40	−0·48	4
ξ² Ceti	2	21	46·73	46·76	+0·03	82	4	43·81	43·31	−0·50	4

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Name of Star.	*N.A.* R.A.			Seconds of Cape R.A.	Cape − *N.A.*	*N.A.* N.P.D.			Seconds of Cape N.P.D.	Cape − *N.A.*	No. of Cape Obs. N.P.D.
	h	m	s	s	s	°	′	″	″	″	
γ^2 Ceti	2	37	4·97	4·98	(+0·01)	87	16	16·22	14·14	−2·08	2
σ Arietis	2	44	52·03	52·09	+0·06	75	24	48·23	46·96	−1·27	2
α Ceti	2	56	0·39	0·39	0·00	86	22	55·84	55·37	−0·47	5
δ Arietis	3	4	46·10	46·13	+0·03	70	43	41·92	41·55	−0·37	3
α Persei	3	15	45·66	45·62	−0·04	40	34	3·30	1·68	−1·62	4
o Tauri	3	18	21·43	21·37	−0·06	81	23	40·73	40·69	−0·04	2
ϵ Eridani	3	27	16·61	16·63	+0·02	99	51	56·91	55·39	−1·52	5
η Tauri	3	40	21·12	21·14	+0·02	66	16	2·70	0·53	−2·17	1
γ Hydri	3	49	6·80	6·89	(+0·09)	164	36	22·03	(23·96)	(+1·93)	23
γ^1 Eridani	3	52	25·78	25·79	+0·01	103	51	4·30	3·64	−0·66	4
A Tauri	3	57	36·09	36·01	−0·08	68	14	51·72	51·60	−0·12	4
o^1 Eridani	4	6	0·41	0·46	+0·05	97	9	6·48	6·28	−0·20	4
γ Tauri	4	12	57·90	57·87	−0·03	74	39	49·01	48·74	−0·27	3
ϵ Tauri	4	21	36·56	36·57	+0·01	71	5	14·21	13·49	−0·72	2
α Tauri	4	29	2·13	2·11	−0·02	73	44	0·43	0·29	−0·14	4
μ Eridani	4	39	30·15	30·13	−0·02	93	28	33·07	34·43	+1·36	2
ι Aurigæ	4	49	10·75	10·77	+0·02	57	1	32·54	32·38	−0·16	2
ϵ Leporis	5	0	22·82	22·82	0·00	112	31	61·12	59·62	−1·50	7
α Aurigæ	5	7	49·55	49·54	−0·01	44	7	34·21	33·61	−0·60	10
β Orionis	5	8	46·23	46·22	−0·01	98	20	30·56	29·62	−0·94	5
β Tauri	5	18	42·45	42·39	−0·06	61	29	45·13	43·84	−1·29	3

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δ Orionis	5	25	52·58	52·57	−0·01	90	23	22·42	21·88	−0·54	5
α Leporis	5	27	26·27	26·23	−0·04	107	54	34·05	33·91	−0·14	3
ε Orionis	5	30	7·41	7·46	+0·05	91	16	48·28	48·47	+0·19	3
α Columbæ	5	35	18·27	18·22	−0·05	124	8	21·11	20·18	−0·93	7
κ Orionis	5	42	3·87	3·89	+0·02	99	42	49·38	48·47	−0·91	3
α Orionis	5	48	40·51	40·48	−0·03	82	37	1·25	0·15	−1·10	3
ν Orionis	6	0	43·23	43·24	+0·01	75	13	7·66	7·70	+0·04	2
η Geminorum	6	7	38·02	38·12	+0·10	67	27	36·34	36·88	+0·54	2
μ Geminorum	6	15	42·07	42·02	−0·05	67	25	36·29	35·82	−0·47	2
α Argûs	6	21	17·21	17·23	+0·02	142	37	50·24	50·04	(−0·20)	3
γ Geminorum	6	30	46·73	46·73	0·00	73	29	59·70	59·57	−0·13	3
ξ Geminornm	6	38	33·25	33·27	+0·02	76	58	36·27	35·12	−1·15	2
α Canis Majoris	6	39	51·58	51·38	(−0·20)	106	33	9·67	11·29	(+1·62)	6
θ Canis Majoris	6	48	36·86	36·88	+0·02	101	53	22·20	22·28	+0·08	2
ε Canis Majoris	6	53	54·59	54·51	−0·08	118	48	35·61	34·93	−0·68	4
γ Canis Majoris	6	58	19·80	19·75	−0·05	105	27	25·43	25·98	+0·55	3
δ Geminorum	7	12	57·39	57·36	−0·03	67	47	54·23	54·25	+0·02	3
β Canis Minoris	7	20	38·56	38·56	0·00	81	28	12·64	12·34	−0·30	3
α² Geminorum	7	26	56·55	56·54	−0·01	57	50	59·70	59·12	−0·58	2
α Canis Minoris	7	33	1·22	1·12	(−0·10)	84	28	8·93	7·14	(−1·79)	3
β Geminorum	7	37	58·28	58·25	−0·03	61	41	7·72	6·74	−0·98	2
ξ Argûs	7	44	14·87	14·81	−0·06	114	33	33·88	34·81	+0·93	3

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Name of Star.	*N.A.* R.A.			Seconds of Cape R.A.	Cape−*N.A.*	*N.A.* N.P.D.			Seconds of Cape N.P.D.	Cape−*N.A.*	No. of Cape Obs. N.P.D.
	h	m	s	s	s	°	′	″	″	″	
6 Cancri	7	56	8·74	8·76	+0·02	61	52	14·94	14·36	−0·58	6
15 Argûs	8	2	26·02	25·96	−0·06	113	57	33·90	33·01	−0·89	6
β Cancri	8	10	0·39	0·42	+0·03	80	26	44·52	44·90	+0·38	2
η Cancri	8	25	46·04	46·06	+0·02	69	9	9·13	8·88	−0·25	3
γ Cancri	8	36	20·37	20·36	−0·01	68	6	3·34	3·19	−0·15	3
ε Hydræ	8	40	25·23	25·18	−0·05	83	8	31·37	30·91	−0·46	3
α Cancri	8	51	55·35	55·41	+0·06	77	40	43·54	43·36	−0·18	2
κ Cancri	9	1	14·81	14·81	0·00	78	50	59·78	58·48	−1·30	2
83 Cancri	9	12	16·88	16·93	+0·05	71	47	13·35	12·13	−1·22	1
ι Argûs	9	13	52·62	(52·68	+0·06)	148	46	19·07	(19·82	+0·75)	3
α Hydræ	9	21	41·37	41·37	0·00	98	8	21·80	21·57	−0·23	6
ο Leonis	9	34	44·67	44·68	+0·01	79	33	44·97	45·52	+0·55	3
ε Leonis	9	39	2·30	2·25	−0·05	65	40	27·01	26·57	−0·44	2
μ Leonis	9	45	56·15	56·10	−0·05	63	25	43·39	42·28	−1·11	2
π Leonis	9	53	52·27	52·28	+0·01	81	22	51·19	50·90	−0·29	5
α Leonis	10	1	58·80	58·78	−0·02	77	26	49·01	48·36	−0·65	3
γ^1 Leonis	10	13	21·28	21·28	0·00	69	33	7·72	7·20	−0·52	2
μ Hydræ	10	20	17·21	17·18	−0·03	106	13	28·21	27·39	−0·82	2
ρ Leonis	10	26	29·54	29·52	−0·02	80	4	36·41	34·94	−1·47	1
η Argûs	10	40	24·46	(24·54	+0·08)	149	3	14·00	(14·05	+0·05)	4
l Leonis	10	42	56·89	56·92	+0·03	78	49	13·13	11·28	−1·85	2

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d Leonis	10	54	21·72	21·76	+0·04	85	44	19·48	18·92	−0·56	3
χ Leonis	10	58	49·57	49·58	+0·01	82	0	57·35	54·98	−2·37	3
δ Leonis	11	7	43·54	43·47	−0·07	68	49	9·09	9·36	+0·27	3
δ Crateris	11	13	20·50	20·46	−0·04	104	7	46·04	45·61	−0·43	3
τ Leonis	11	21	45·90	45·97	+0·07	86	28	58·46	59·72	+1·26	3
υ Leonis	11	30	48·22	48·24	+0·02	90	9	41·22	40·73	−0·49	3
β Leonis	11	42	56·26	56·24	−0·02	74	45	25·91	25·63	−0·28	3
π Virginis	11	54	43·41	43·41	0·00	82	42	60·91	58·15	−2·76	2
ε Corni	12	3	57·29	57·21	−0·08	111	57	8·25	8·06	−0·19	3
β Chamæleontis	12	11	20·53	20·40	(−0·13)	168	38	44·29	45·19	(+0·90)	12
η Virginis	12	13	45·94	45·96	+0·02	89	59	59·43	59·34	−0·09	2
α Crucis (Mean)	12	19	56·35	56·42	(+0·07)	152	26	2·24	3·06	(+0·82)	8
δ² Corvi	12	23	39·50	39·39	−0·11	105	50	50·30	49·95	−0·35	2
β Corvi	12	28	4·96	5·01	+0·05	112	43	58·90	58·46	−0·44	3
γ Virginis (Mean)	12	35	34·83	34·75	(−0·08)	90	47	29·24	27·43	(−1·81)	3
δ Virginis	12	49	33·55	33·54	−0·01	85	57	1·36	0·77	−0·59	2
α Canum Venat.	12	50	24·73	24·72	−0·01	51	1	59·51	60·54	+1·03	5
ε Virginis	12	56	12·20	12·19	−0·01	78	23	43·88	43·68	−0·20	1
θ Virginis	13	3	44·21	44·23	+0·02	94	53	52·84	53·01	+0·17	7
α Virginis	13	18	52·27	52·26	−0·01	100	32	4·18	4·47	+0·29	4
ζ Virginis	13	28	34·75	34·72	−0·03	89	58	54·25	54·49	+0·24	4
τ Boötis	13	41	33·58	33·56	−0·02	71	56	40·23	41·97	+1·74	1

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Name of Star.	*N.A.* R.A. h	m	s	Seconds of Cape R.A. s	Cape—*N.A.* s	*N.A.* N.P.D. °	′	″	Seconds of Cape N.P.D. ″	Cape—*N.A.* ″	No. of Cape Obs. N.P.D.
η Boötis	13	48	58·28	58·19	−0·09	70	59	60·58	59·91	−0·67	1
β Centauri	13	55	21·99	22·09	(+0·10)	149	47	35·15	35·09	(−0·06)	51
τ Virginis	13	55	32·39	32·38	−0·01	87	52	27·92	26·13	−1·79	1
α Boötis	14	10	11·30	11·23	−0·07	70	11	30·53	30·97	+0·44	4
f Boötis	14	20	52·57	52·48	−0·09	70	13	58·33	58·77	+0·44	1
ρ Boötis	14	26	39·52	39·43	−0·09	59	6	3·90	3·78	−0·12	1
α² Centauri	14	31	27·14	27·26	(+0·12)	150	20	27·99	24·19	(−3·80)	49
α Libræ	14	44	14·47	14·46	−0·01	105	32	31·68	30·97	−0·71	2
ψ Boötis	14	59	18·26	18·19	−0·07	62	35	1·20	2·46	+1·26	1
β Libræ	15	10	32·97	32·99	+0·02	98	56	20·56	21·25	+0·69	3
α Coronæ	15	29	36·46	36·40	−0·06	62	52	49·71	49·40	−0·31	1
α Serpentis	15	38	21·45	21·45	0·00	83	11	45·01	44·26	−0·75	3
ε Serpentis	15	44	50·06	50·11	+0·05	85	9	36·34	36·83	+0·49	2
β¹ Scorpii	15	58	27·61	27·62	+0·01	109	28	32·56	32·55	−0·01	4
δ Ophiuchi	16	8	3·39	3·41	+0·02	93	23	2·23	3·17	+0·94	4
γ Herculis	16	16	37·58	37·59	+0·01	70	33	50·00	50·76	+0·76	1
α Scorpii	16	22	3·05	2·97	−0·08	116	9	50·82	50·59	−0·23	13
ζ Ophiuchi	16	30	33·09	33·08	−0·01	100	19	22·03	20·99	−1·04	1
α Trianguli Aust.	16	35	58·32	58·32	0·00	158	48	15·87	16·08	+0·21	22
κ Ophiuchi	16	51	59·23	59·28	+0·05	80	26	13·58	13·74	+0·16	2
η Ophiuchi	17	3	29·75	29·78	+0·03	105	34	29·03	29·18	+0·15	7

α^1 Herculis	17	9	10·54	10·53	−0·01	75	28	18·40	18·87	+0·47	2
θ Ophiuchi	17	14	38·39	38·35	−0·04	114	52	40·03	40·35	+0·32	4
σ Ophiuchi	17	20	33·63	33·75	+0·12	85	45	14·20	15·79	+1·59	1
α Ophiuchi	17	29	21·79	21·82	+0·03	77	21	4·56	4·24	−0·32	3
β Ophiuchi	17	37	32·62	32·67	+0·05	85	22	52·67	51·72	−0·95	2
μ Herculis	17	41	45·73	45·66	−0·07	62	12	29·67	29·10	−0·57	2
72 Ophiuchi	18	1	39·60	39·63	+0·03	80	27	7·67	6·71	−0·96	2
μ Sagittarii	18	6	35·11	35·15	+0·04	111	5	19·11	18·42	−0·69	3
η Serpentis	18	15	5·99	6·00	+0·01	92	55	41·84	43·43	+1·59	4
λ Sagittarii	18	20	33·86	33·84	−0·02	115	29	12·93	10·89	−2·04	5
σ Octantis	18	24	30·43	29·62	(−0·81)	179	16	30·02	29·92	(−0·10)	170
α Lyræ	18	32	52·52	52·47	−0·05	51	19	38·36	38·81	+0·45	3
β^1 Lyræ	18	45	38·95	38·90	−0·05	56	49	33·07	32·73	−0·34	1
ϵ Aquilæ	18	54	10·48	10·53	+0·05	75	5	37·11	36·18	−0·93	1
ζ Aquilæ	18	59	53·56	53·62	+0·06	76	18	49·25	49·95	+0·70	2
ω Aquilæ	19	12	10·96	10·99	+0·03	78	37	11·52	11·63	+0·11	3
δ Aquilæ	19	19	26·78	26·82	+0·04	87	7	23·56	23·78	+0·22	5
h^2 Sagittarii	19	29	24·13	24·16	+0·03	115	8	47·86	48·89	+1·03	3
γ Aquilæ	19	40	33·28	33·25	−0·03	79	40	41·47	40·88	−0·59	4
α Aquilæ	19	44	55·68	55·67	−0·01	81	26	51·19	49·64	−1·55	5
β Aquilæ	19	49	25·09	25·09	0·00	83	53	30·76	31·02	+0·26	5
θ Aquilæ	20	5	6·73	6·77	+0·04	91	10	34·88	34·64	−0·24	3

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Name of Star.	*N.A.* R.A.			Seconds of Cape R.A.	Cape−*N.A.*	*N.A.* N.P.D.			Seconds of Cape N.P.D.	Cape−*N.A.*	No. of Cape Obs. N.P.D.
	h	m	s	s	s	°	′	″	″	″	
α^2 Capricorni	20	11	23·67	23·69	+0·02	102	54	56·35	56·52	+0·17	3
α Pavonis	20	16	8·67	8·77	(+0·10)	147	7	2·85	3·13	(+0·28)	3
ρ Capricorni	20	22	0·77	0·83	+0·06	108	12	32·87	32·69	−0·18	4
ε Delphini	20	27	28·74	28·78	+0·04	79	6	12·63	13·33	+0·70	2
α Cygni	20	37	20·43	20·44	+0·01	45	8	52·43	52·20	−0·23	1
Aquarii	20	41	10·68	10·72	+0·04	99	56	2·51	2·47	−0·04	3
32 Vulpeculæ	20	49	26·73	26·67	−0·06	62	23	53·20	54·03	+0·83	1
θ Capricorni	20	59	11·98	11·96	−0·02	107	42	30·73	31·51	+0·78	3
ζ Cygni	21	7	49·70	49·69	−0·01	60	15	53·06	52·48	−0·58	2
β Aquarii	21	25	14·38	14·42	+0·04	96	5	53·81	53·41	−0·40	7
ε Pegasi	21	38	17·56	17·49	−0·07	80	40	28·65	28·52	−0·13	3
16 Pegasi	21	47	36·17	36·11	−0·06	64	38	20·52	18·67	−1·85	3
α Aquarii	21	59	37·11	37·16	+0·05	90	54	8·34	7·75	−0·59	10
α Gruis	22	0	39·75	39·78	(+0·03)	137	32	28·64	27·97	(−0·67)	3
θ Aquarii	22	10	29·98	30·01	+0·03	98	22	49·35	49·04	−0·31	3
γ Aquarii	22	15	27·41	27·43	+0·02	91	59	28·73	28·98	+0·25	4
η Aquarii	22	29	11·30	11·34	+0·04	90	44	8·12	7·98	−0·14	7
ζ Pegasi	22	35	28·54	28·59	+0·05	79	47	40·98	40·96	−0·02	6
λ Aquarii	22	46	21·09	21·17	+0·08	98	13	3·44	3·80	+0·36	3
α Piscis Aust.	22	51	0·93	0·93	0·00	120	15	29·15	28·20	−0·95	6
α Pegasi	22	58	46·99	46·98	−0·01	75	26	24·26	24·10	−0·16	3

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γ Piscium	23	10	56·60	56·60	0·00	87	22	24·54	23·79	−0·75	3
κ Piscium	23	20	46·81	46·83	+0·02	89	24	4·82	4·61	−0·21	9
ι Piscium	23	33	46·67	46·67	0·00	85	1	26·83	26·83	0·00	9
δ Sculptoris	23	42	40·37	40·32	−0·05	118	47	37·32	37·36	+0·04	3
ω Piscium	23	53	8·94	8·95	+0·01	83	48	4·23	3·51	−0·72	7

The large error in the *Nautical Almanac* for **α *Centauri*** is chiefly due to the proper motion used in the *Nautical Almanac*.

The mean N.P.D.'s of λ *Sagittarii* from the Greenwich Catalogues 1860, 1864, and 1872 corrected, are 115° 29′ 11″·75, 12″·94, and 10″·48, respectively. The Cape Catalogue for 1860 gives 115° 29′ 11″·55. The large discordance therefore does not appear to be mainly due to error in the Cape observations.

16 *Pegasi*. There is one very discordant observation included in the Cape mean result. If this observation were rejected, the Cape N.P.D. would be 64° 38′ 19″·40, with a difference of − 1″·12 from the *Nautical Almanac*. The Greenwich results are accordant, but I can see no reason for doubting the Cape result, except to the extent mentioned.

χ *Leonis*. The Cape observations appear correct.

π *Virginis*. One of the observations was picked up through cloud. The N.P.D. appears to be about 4″ too small, and should probably be rejected.

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The following are the corrections required by the *Nautical Almanac* Right Ascensions in order that they should agree with the Cape observations:—

R.A.

0^h to 6^h	6^h to 12^h	12^h to 18^h	18^h to 24^h
$+0^s.001$	$-0^s.005$	$-0^s.018$	$+0^s.010$

The clock-errors at the Cape were determined from Right Ascensions based upon the Greenwich Fundamental Right Ascensions, and the above agreement is therefore no more than might fairly be expected; but these differences agree in sign with those which I obtained, when forming the Cape Catalogue for 1860, from a discussion of the observations made during the years 1856 to 1860. It is probable, therefore, that, although very small, these differences do not arise from mere chance errors of observation.

The refractions used for the reduction of the Cape observations have been computed from the *Tabulæ Regiomontanæ*; but no change has been made in the coefficient in passing through the zenith distance 85°. The barometer used has been the standard one of the Observatory. The thermometer is the one read for the temperature of the air and is exposed in a cage, with free circulation of air, before a southern window of the Transit-Circle room. The thermometer reads too high by $0^\circ.55$ F. To avoid mistakes, I thought it better to enter and reduce the observations with the readings uncorrected. The refractions used in the reductions are therefore those of the *Tabulæ Regiomontanæ* reduced in the ratio of

$$0.9988 \text{ to } 1.$$

I have examined, from time to time, the accuracy with which the refractions thus computed represented the Cape observations, and have been satisfied upon the point.*

The residual errors given in the present paper will, however, afford additional information on the point.

The latitude of the Observatory adopted in the formation of the Catalogue is

$$33^\circ\ 56'\ 3''.41 \text{ South.}$$

If $33^\circ\ 56'\ 3''.41 - x$ is assumed to be the true south latitude and Tab. refra. $(1+y)$ the true refraction, the following are the values of x which result from a discussion of all the observations above and below the Pole contained in the Catalogue.

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* *See* Cape Catalogue, 1860, Introduction; Cape Observations, 1871, 1872, and 1873 and 1874.

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Mean N.P.D.	
° °	″
175 to 180	$x = +0{\cdot}09 + 87\,y$.
170	$x = +0{\cdot}16 + 95\,y$.
165	$x = -0{\cdot}05 + 109\,y$.
160	$x = -0{\cdot}24 + 136\,y$.
154	$x = -0{\cdot}34 + 213\,y$.
150	$x = +0{\cdot}05 + 366\,y$.

The corrections which x and y require must therefore be very small.

The refractions of Bessel's *Tabulæ Regiomontanæ* appear to represent the Cape observations in *mean* results with considerable accuracy. So far as these colatitude equations are alone concerned, the agreement between the different values of x would be slightly improved if the correction for the index error of the thermometer had been applied, or if y had been put equal to 0·001. The changes thus introduced would, however, be unimportant, and it would appear, from what follows, very doubtful whether these changes are really required. I have, at all events, not considered it necessary to introduce the changes, and the North Polar Distances of the Cape Catalogue are therefore, as before stated, based on Bessel's mean refractions diminished in the ratio of

0·9988 to 1.

If we divide the corrections to the North Polar Distances of the *Nautical Almanac* into four groups depending upon N.P.D., we have the following corrections:—

	N.P.D. ° ° 40 to 60	N.P.D. ° ° 60 to 90	N.P.D. ° ° 90 to 105	N.P.D. ° ° 105 to 124
	″	″	″	″
Correction =	−0·33	−0·35	−0·15	−0·40

These corrections are all small and there does not appear to be any systematic change in them depending upon the N.P.D. of the group. This is a further proof of the substantial accuracy of the refractions adopted, and we are justified in forming a general mean result. We have therefore for the mean result—

$$N.A.\ \text{N.P.D.} = \text{Cape N.P.D.} + 0{\cdot}31''.$$

Next, in order to test whether there is any large outstanding correction depending upon the meteorological elements, I shall give the corrections required by the *Nautical Almanac* North Polar Distances for groups of six hours of Right Ascension.

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From	0^h to 6^h	6^h to 12^h	12^h to 18^h	18^h to 24^h
Correction =	−0″·55	−0″·42	+0″·08	−0″·25

Applying to these corrections the general mean correction −0″·31, we have

From	0^h to 6^h	6^h to 12^h	12^h to 18^h	18^h to 24^h
Correction =	−0″·24	−0″·11	+0″·39	+0″·06

The changes in these corrections are systematic, and it appears that the complete reversion of the seasons at the northern and southern Observatories is not quite accurately allowed for in our refraction tables. The observations 0^h to 6^h R.A. were made during the dry seasons at the Cape, and the tabular refractions used are apparently relatively too large. The observations from 12^h to 18^h were made during the wet seasons at the Cape, and the tabular refractions used are apparently relatively too small. But the changes in humidity at the Cape are simultaneous with considerable changes in mean temperature.

There cannot, I should conceive, be any doubt about the systematic character of the small discordance to which I have called attention; but there will probably be differences of opinion respecting the cause.

Some astronomers will probably consider it to arise from an imperfect correction for changes of temperature, whilst others may consider it due to the neglect of any alteration of refraction as dependent upon moisture. My own opinion is that the last explanation is likely to be the true one. I was led to a similar result many years ago, and I hope before long to be able to investigate the question of the effects of humidity upon refraction.

Ephemeris for finding the Positions of the Satellites of Uranus, 1880.

By A. Marth, Esq.

Angle of position, p_0, of the major axes, major and minor semi-axes, a and b, of the apparent ellipses described by the satellites, and latitude of the Earth above the plane of their orbits.

Greenwich Noon.	p_0	*Ariel.*		*Umbriel.*		*Titania.*		*Oberon.*		Lat. of Earth.
		a	b	a	b	a	b	a	b	
1880.	°	″	″	″	″	″	″	″	″	°
Jan. 15	14·03	15·05	1·88	20·96	2·60	34·38	4·25	45·98	5·72	−7·16
25	13·97	15·14	1·97	21·09	2·74	34·60	4·49	46·27	6·01	7·46
Feb. 4	13·91	15·21	2·07	21·19	2·89	34·76	4·74	46·49	6·33	−7·82
14	13·84	15·26	2·18	21·26	3·04	34·87	4·99	46·63	6·67	8·23
24	13·76	15·28	2·30	21·29	3·20	34·92	5·25	46·69	7·03	8·66